ANTHURIUM CULTURE IN HAWAII

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CONTENTS

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Tadashi Higaki and Donald P. Watson

INTRODUCTION

The anthurium, *Anthurium andraeanum*, a native of Central America, was first brought to Hawaii from London in 1889 by Mr. S. M. Damon. Today, after 78 years of cultivation and hybridization, the Hawaiian anthurium is one of the islands' principal ornamental exports to the mainland, Canada, Japan, Germany, and other countries.

The anthurium belongs in the family Araceae which includes more than 100 genera and about 1,500 species, chiefly from the tropics. Some of the better known members of the family include the pig-tail anthurium, philodendron, monstera, taro vine, taro, calla lily, caladium, ape, and dieffenbachia, most of which grow in the shade where it is damp or in the water.

The anthurium is a perennial herbaceous plant usually cultivated for its attractive, long-lasting flowers. What is commonly considered the flower is a complex of the colorful modified leaf (spathe) and hundreds of small flowers on the pencil-like protrusion (spadix) rising from the base of the spathe.

The anthurium plant produces flowers throughout the year. One flower emerges from each leaf axil. The sequence of leaf, flower, and new leaf is maintained throughout the entire life of the plant and the intervals between leaf emergences are shortened or lengthened with changes in the environmental conditions. During the summer months when conditions are favorable for growth, more flowers can be expected per plant than during the winter months, when temperatures are lower and less light is available.

Commercial planting of anthurium.

INCREASE IN PLANTINGS

Growing anthuriums was for many years a kind of "back-yard" operation. It is rapidly becoming a commercial business with individual growers in East Hawaii planting up to 5 and 10 acres. There are now 375 anthurium growers cultivating 167 acres.

COMMON CULTIVARS

Standards

While the first anthurium introductions were pastel flowers, there has been a constant change in the popularity of colors. Today there are hundreds of different seedling anthuriums, but only a few are acceptable commercially.

A desirable plant should grow vigorously and be a prolific producer of suckers and flowers. Short internodes are preferred in order to limit the height of the plant. A desirable spathe is heart-shaped with symmetrical, overlapping or fused lobes. Good spadices are somewhat shorter than the length of the spathe. A gently reclining spadix will facilitate packing for shipment.

Reds

'Ozaki.' The spathe is light red, broad, heart-shaped, with overlapping lobes, usually large, 6½ x 6¼ inches (length x width). The reddish - purple spadix is usually 3½ inches long and reclines but becomes more erect as the flower matures. The yield is high and the production of suckers is good. To prevent sun burn, 'Ozaki' requires more shade than some other cultivars.

'Kaumana.' The dark red, open, heart-shaped spathe is usually 5¼ x 4¼ inches (length x width). The white spadix is usually 3½ inches long and reclining. 'Kaumana' is one of the most reliably high-yielding, small- to medium-sized anthuriums. It grows rapidly and produces many suckers.

'Kozohara.' The spathe is dark red (similar to 'Kaumana'), heart-shaped with overlapping lobes, usually large, 6¼ x 5 inches (length x width). The reclining white spadix is 3¾ inches long. 'Kozohara' is one of the most reliably high-yielding, large- to extra large-sized red anthuriums. The yield of flowers and suckers is average.

'Kansako.' The red, heart-shaped spathe with overlapping lobes is usually medium

'Kansako' red anthurium.

in size, 5¼ x 4½ inches (length x width). The reclining spadix is usually 3¾ inches long. 'Kansako' is another reliably high-yielding red anthurium similar to 'Kaumana' and 'Kozohara' but produces relatively long stems holding the spathes and spadices high, protecting the flowers from bruising by the foliage. The 'Kansako' has a tendency to produce deformed flowers during the hot summer months.

Other popular reds include: 'Pahoa,' a medium-sized dark red; 'Hayashi,' a large dark red; 'Toyama,' another large, open-hearted dark red; 'Tanaka,' a medium-sized, bright fire-engine red.

Oranges

'Nitta.' The orange, broad, heart-shaped spathe with overlapping lobes is usually 6 x 5 inches (length x width). The white reclining spadix is usually 3¾ inches long. Among the orange anthuriums, 'Nitta' is the principal commercial variety. It is a vigorous grower, suckers freely, and produces high yields. Although the flowers are extremely strong and have a long shelf-life, 'Nitta' has a tendency to produce flowers that are flat and more or less parallel in line with the stem.

'Sunburst.' This small, broad, heart-shaped, bright orange spathe is gaining rapidly in popularity. 'Sunburst' is a high producer and suckers fairly well. Its regularity in production of small flowers with good profile makes it desirable.

Whites

'De Weese.' The white, open, heart-shaped spathe is usually small, 3¾ x 3¾ inches (length x width). Its yellow reclining spadix is 3¾ inches long. The yield of flowers is fairly high and it produces

suckers prolifically. At the present time, it is perhaps the most plentiful of white anthuriums.

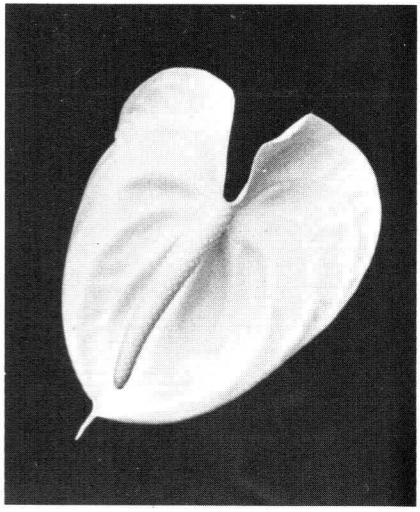
'Uniwai.' The small, heart-shaped, white spathe has overlapping lobes. During the spring months, the young flowers often develop a slight tinge of pink. The spadix is yellow, short, and reclining when young but turns upright with maturity. 'Uniwai,' a recent introduction of the University of Hawaii, does not sucker freely, but it is such an outstandingly high yielding plant that it is in great demand by commercial growers.

While there is an increasing demand for white anthuriums, many seedlings are being grown and it is difficult to designate any major white commercial cultivar.

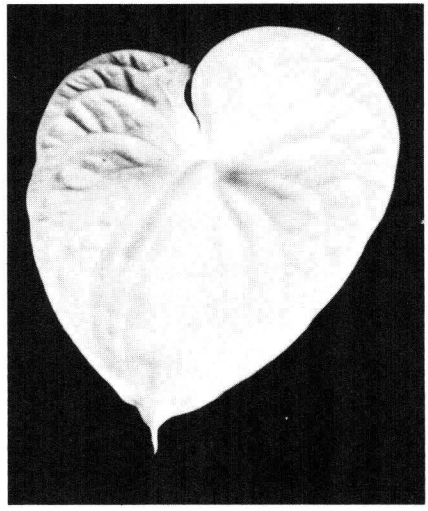
Pinks

'Abe.' The medium - sized bright pink, heart-shaped spathe subtends a white, reclining spadix. A fairly high yielding cultivar which produces suckers freely, 'Abe' is gaining in popularity. During the summer months it has a tendency to produce deformed flowers.

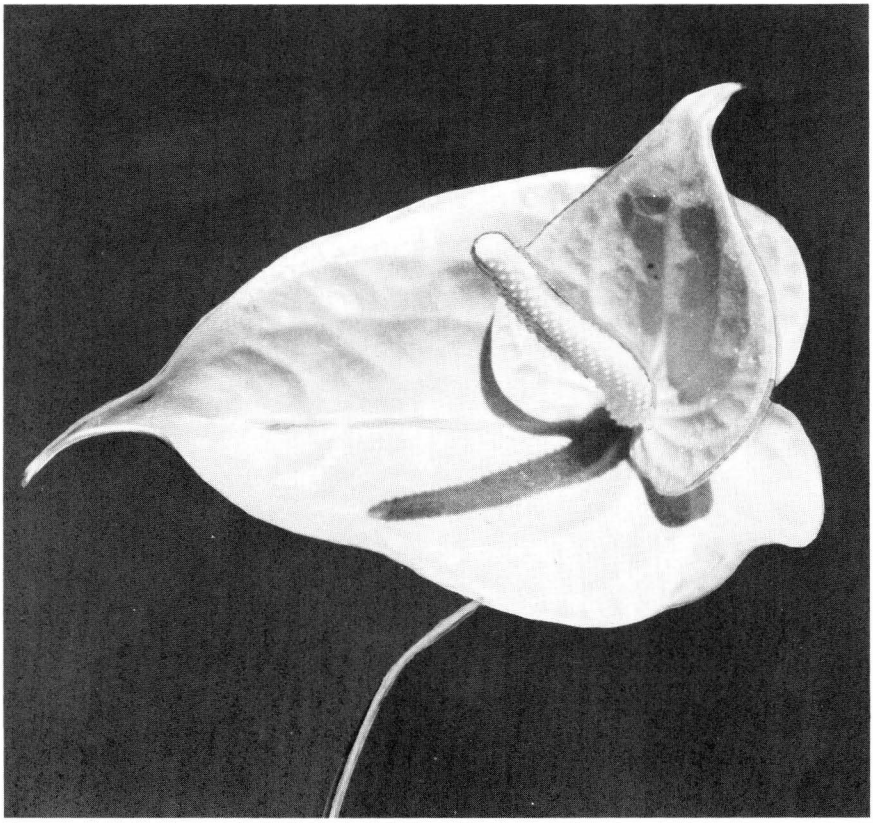
'Marian Seefurth.' The broad, heart-shaped, rich rose-pink spathe has unusually large, 6½ x 5½ inches (length x



White anthurium.



Marian Seefurth.



Typical double anthurium.

Standards for Anthuriums

Hawaii State Department of Agriculture

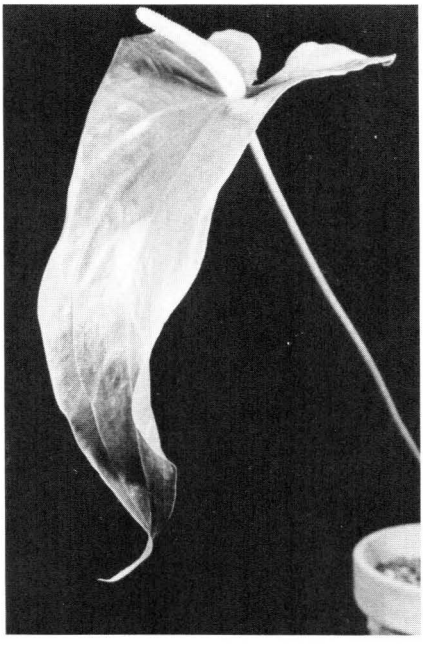
GRADE	AVERAGE OF LENGTH + WIDTH OF SPADIX
Miniature	under 3″
Small	over 3″-4″
Medium	over 4″-5″
Large	over 5″-6″
Extra large	over 6″

width), overlapping lobes. The spadix is greenish-yellow and drooping when young, white and upright when mature. This recent University of Hawaii introduction suckers freely and is an exceptionally high-yielding cultivar.

Novelties

'Obake.' These types are extremely variable in size and shape but usually contain some development of chlorophyll in the spathes. Some are almost all green, some white and green combinations, others are red, pink, orange and green combinations. Many of the most grotesque 'Obakes' are rapidly gaining in popularity.

'Double.' The double flowering anthurium produces one small and one large spathe on the same stem with a single spadix. Red, pink, orange, and even obake doubles may be found.



'Obake' anthurium.

'Brown.' Unusual brown spathes, usually with green spadices, are being grown to a limited extent.

'Blush.' White spathes with red veins that diffuse out from the dark red spadix are gaining in popularity. They vary in intensity from those with a few red veins (splashes) to those with many tiny, red veins (blushes).

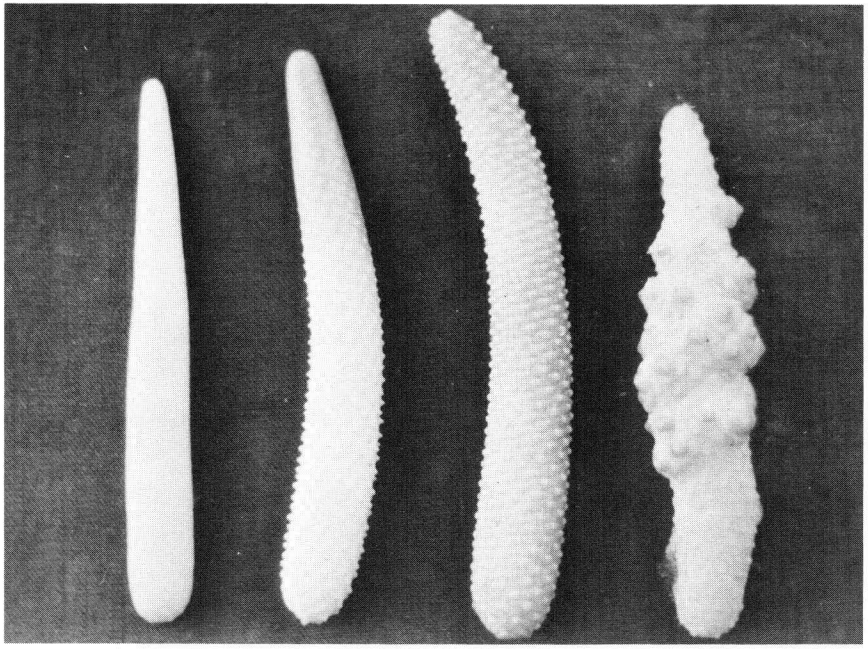
PROPAGATION

Cuttings

Vegetative propagation, the asexual method of propagation, insures that the offspring will be identical with the parent.

One common method of increasing a particular cultivar is to grow the plant until some roots have developed high on the stem near the top. The top with these roots is then removed to produce a new plant. The remaining base of the stem with its roots will then develop two or more side shoots (suckers). By repeating this procedure large numbers of plants may be propagated. The tendency of a plant to produce suckers is not only inherent in the cultivar but also influenced by the environment in which it is grown. Stems may be placed on their side in damp propagating media to encourage the production of new shoots.

Vegetative propagation.



Left to right: Young spadix, spadix with female flowers visible, spadix with pollen visible, spadix with seeds developing.

Individual anthurium flower showing stigma in center, surrounded by four anthers and four fleshy tepals.

Seeds

To grow anthurium plants from seed is a lengthy process. It may take three years for a plant that is started from seed to bloom. Each new plant grown from seed will in some way be different from each parent.

An individual anthurium flower is in reality a small segment of the spadix. The individual flowers are hermaphroditic, with a two-carpelled ovary and four anthers. The rudimentary perianth consists of four fleshy tepals. When mature, the stigma appears as a rounded protuberance on the spadix. When these are ready to be pollinated, they are damp and shiny.

Controlled pollination is accomplished by grasping the pollen-laden spadix with the fingers and then transferring the pollen to the receptive stigmas of another flower by rubbing the spadix with the same fingers. Once pollination and fertilization are accomplished, the spadix gradually takes on a warty appearance, and after 6 to 7 months, many mature, two-carpelled, one- to two-seeded yellow berries are formed. The yellow berries are collected and pressed lightly to squeeze one or two green seeds out of the pulp.

In planting, these seeds are scattered on finely shredded hapuu (tree-fern fibers) or peat moss and stored under 75-percent shade. The seeds germinate immediately and within 4 to 6 months can be transplanted. The seedlings can be expected to flower no sooner than 1½ years after seeding, and often 2½ to 3 years are required for the majority of the seedlings to come into flowering.

ENVIRONMENTS

Media

Anthuriums grow in a high organic, well-aerated medium with good water retention capability, yet good drainage. A good medium needs to be able to anchor the roots and stem so that the plant will not topple over as it grows upward yet provide sufficient moisture, nutrients, and aeration to the plant. Wood shavings, sugar-cane bagasse, tree-fern chips, taro peel, macadamia nut shells, or coffee parchment will serve as a good medium to anchor the roots.

Some growers plant anthurium between rocks or in hapuu chips or volcanic cinders to provide the anchorage followed by a mulching with bagasse to retain the moisture.

Spacing

The most common planting distance is a 1½ x 1½ feet, allowing roughly 12,000 plants per acre. The present trend for maximum production is to practice closer planting with heavy pruning every four year. These closer, 1 x 1-foot plantings provide approximately 25,000 plants per acre. With 1½ feet between the rows and 6 inches within the rows, approximately 30,000 plants per acre can be accommodated.

Since dense plantings prevent good air circulation and hinder spray penetration, rigid leaf pruning and spraying must be followed to keep disease and insect damages at a minimum. An anthurium plant may be pruned to a minimum of four leaves without any adverse effect on flower production and quality.

Planting distance varies with the vigor of the cultivar, the type of shade, and the planting rotation plan of the grower. Generally, 'Kaumana' may be planted closer than 'Kozohara,' which produces larger flowers. Saran cloth houses can accommodate closer planting than if the plants are grown under tree ferns.

Authurium planting under tree ferns.

Light

Shade from sunlight is necessary for normal growth of anthuriums. The degree of shading varies with the cultivar, the age of the plant, and the climate under which it is grown. The shade requirements usually range from 50 to 90 percent of full sunlight. Insufficient shading often results in damage to leaves and even eventually death of the plant.

Growers use various methods to provide shade for anthuriums. Many producers are using saran cloth houses supported with lumer or galvanized pipes and wire. Saran cloth houses give the following advantages. They provide uniform shade, permit plants to be planted immediately after construction, reduce bird and insect damage to a minimum, provide maximum freedom of work space, and provide more flowers per unit area. Their present cost is approximately $5,000 per acre.

Lath houses or plantings of tree fern (*Cibotium chamissoi*), 8 x 8 feet apart, are also used to provide shade. Approximately 600 tree ferns are required to the acre and they take approximately 1½ years to provide sufficient shade to be ready to start planting the anthuriums.

Some growers use a cleared forest area, or citrus or lychee trees for shading.

Temperature

Anthuriums thrive when the night temperature is never lower than 65°F. and the day temperature is about 80°F.

Fertilizer

Fertilizers such as 5-10-10, 10-20-20, or 16-16-16 are applied at the rate of approximately 200 pounds of nitrogen per acre per year. Care must be taken to water the plants after application of fertilizer because the fertilizer has a tendency to burn the foliage. The pelletized forms are less damaging.

Many growers use organic fertilizers such as chicken manure or tankage. Approximately 2,000 to 3,000 pounds of organic fertilizers are applied per acre annually. Applications are made every other month or quarterly.

Anthurium Special, DC81, and DL60 anthurium fertilizers are combinations of organic and inorganic chemicals. They should be applied as recommended on the container.

Liquid fertilizers may be applied as foliar applications as often as once or twice a month.

PESTS

Mites

Broad mites feed on the lower surface of young developing leaves, causing stunting and curling of the leaves. *Spider mites* group together in colonies on the lower surface of mature leaves; their presence can be detected by the speckled or stippled appearance of the leaves. *False spider mites* feed on the petiole and lower surface of leaves, causing the formation of bronze or brown scarified markings.

When high populations of these mites occur on the plant, the leaves turn yellow and drop prematurely. The plants become stunted, but seldom die.

Control

Chlorobenzilate: 1 quart of 4 emulsifiable concentrate (EC) or 1½ pounds of 25 percent wettable powder (WP) in 100 gallons of water.

Dicofol (Kelthane): 1 quart of 18.5 percent EC *or* 2 pounds of 18.5 percent WP in 100 gallons of water.

Sulfur: 6 pounds of 95 percent wettable sulfur in 100 gallons of water.

Insects

Aphids, Mealybugs and Scales. Aphids, mealybugs, and scales are often spread by ants. Their feeding activity results in a serious loss of plant vigor. The production of honeydew by these insects also encourages the growth of a black, sooty fungus which discolors the leaves and flowers.

Thrips. Thrips feed on the flowers in the bud stage, causing white streaks to appear on the spathe as it opens. These flowers are unmarketable.

Grasshoppers. Grasshoppers make holes in the leaves and spathes.

Control

DDT: 2 quarts of 25 percent EC *or* 2 pounds of 50 percent WP in 100 gallons of water for grasshoppers or thrips.

Diazinon: 1 pound of 50 percent WP *or* 2 pounds of 25 percent WP *or* 1½ pints (3 cups) of 25 percent EC in 100 gallons of water for aphids, mealybugs and scales.

Lindane: 1½ pints (3 cups) of 20 percent EC *or* 1 pound of 25 percent WP in 100 gallons of water for aphids, grasshoppers or thrips.

Malathion: 2 quarts of 57 percent EC *or* 4 pounds of 25 percent WP in 100 gallons of water for scales or mealybugs.

Snails and Slugs

Snails and *slugs* feed on the leaves and flowers. As the flowers mature, a brown scar develops on the spadix which makes the flowers unmarketable.

Control

Use commercially available bait formulations containing metaldehyde and/or calcium arsenate for snails *or* for snails and slugs, use a 1 percent metaldehyde-water suspension. Spray the ground around the plants.

For small quantities of spray

With *wettable powders* (WP), 1 level tablespoon in a gallon of water is close to 1 pound per 100 gallons of water.

With *emulsifiable concentrates* (EC), 1 teaspoon per gallon of water is close to 1 pint per 100 gallons of water.

READ THE LABEL ON THE PESTICIDE CONTAINER.
HEED THE LABEL ON THE PESTICIDE CONTAINER.

Diseases

Spadix rot. Anthracnose, *Colletotrichum gloeosporioides,* is the most serious disease of anthurium. It causes black specks to appear on the spadix, making the flowers unmarketable. The rot starts as a tiny black spot and eventually spreads throughout the spadix. 'Kaumana' and 'Kozohara' are most susceptible to this disease; other varieties seem to be quite tolerant. The fungus thrives best in warm, humid weather.

Control

2 pounds maneb (70 percent WP) per 100 gallons of water.

Mosaic. This virus is occasionally found in anthuriums with the diseased plants showing severe leaf deformation and stunting. The spathe may become discolored and crinkled. These plants should be rogued and burned out immediately to prevent the virus from spreading to other plants. The virus may be transmitted by the common white fly, *Bemisia tabaci* Genn.; therefore, a regular insecticide spray will help prevent it from spreading.

Root rot. Occasionally root rot caused by water molds such as *Phythium* sp. is known to occur. A soil drench such as captan is recommended for control.

Birds

The Mejiro bird at some seasons of the year nips the unopen upper tip of the spathe. Colorful objects such as tin pie plates or strips of colored plastic hung in the vicinity of the planting will help scare these birds away.

Weeds

Oil sprays or activated oil emulsions are recommended for use on roadways and border areas. There is no noticeable injury to the plants unless they are in direct contact with the oil.

Experimental use of 'Karmex' (diuron) at 2 pounds per acre as a directed spray has produced good results, but this practice has not been used sufficiently to show long-term effects on the anthurium plant.

HARVESTING

Anthuriums are usually harvested once a week. The maturity of the flowers for harvesting is determined by the firmness of the peduncle and the degree of color change of the spadix.

The flowers mature on the spadix from the base towards the apex. As they mature a change of color can be observed that moves from the base to the tip of the spadix within a period of from 3 to 4 weeks. After the lower quarter of the spadix has changed color, the anthurium is referred to as one-quarter mature.

Most anthuriums are harvested at three-quarters maturity because it is believed that at this time they have the longest shelf-life as cut flowers.

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